Title: Imaging Spectropolarimetry in He I 1083.0 nm at the DST

Magnetism in the solar chromosphere is structured on all spatial scales. EUV imagery from the Solar Dynamics Observatory (SDO) show clearly the complex interconnectivity of the magnetic field over large distances between active regions and the quiet-Sun net- work. The ChroMag full-disk imaging polarimeter is designed to diagnose chromospheric magnetic field in a synoptic fashion. At the very finest resolution, we find dynamic features such as spicules, mottles, and fibrils (for a review see, e.g., Tsiropoula et al. 2012). High-resolution instruments like the Interferometric Bidimensional Spectrometer (IBIS) on the Dunn Solar Telescope (DST) are shedding light on the complex environment of the chromosphere. These instruments typically observe the Hα line at 656.3 nm and the Ca ii line at 854.2 nm. The He i line at 1083.0 nm has been largely neglected by imaging polarimeters. However, this line is known to be a powerful diagnostic of chromospheric magnetic field (see recent works by,e.g.,Orozco Suárez et al. 2014, Schad et al. 2013, Kuckein et al. 2012, Centeno et al. 2010). It is often observed using traditional spectrographs such as SPINOR and FIRS at the DST that must sacrifice spatial information and temporal cadence to achieve high spectral resolution and signal to noise.

We propose to address the lack of polarimetric observations with high cadence and high spatial resolution in the He i line at 1083.0 nm by using the ChroMag Lyot filter-polarimeter that has an operating wavelength range of 580 nm to 1100 nm at the DST. Our goals are to observe active regions, filaments, prominences, and spicules at the diffraction limit of the DST with high cadence and signal-to-noise adequate for the application of spectro-polarimetric inversion codes.

In addition to providing data for studies of chromospheric magnetism, these obser- vations will function as a proof-of-concept for future instruments such as the planned Japanese SOLAR-C mission that is to have a filter-polarimeter with specifications not dissimilar from the ChroMag Lyot filter.

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Time period: March 4-10 2015; observations requested every day if possible, but I will communicate weather forecasts etc. in time for planning purposes.

Time window: 15:00-17:00 UTC is statistically the best window, 14:30-18:00 UTC would be preferable. Short interruptions are of course undesirable, but allowed.

Targets: 1st priority is an on-disk active region. I will follow the Max Millennium target if it is appropriate. Lower priorities are filaments, prominences, and spicules (i.e., AR on limb, coronal hole at the limb, etc.). I will communicate the target for each day well in advance for planning purposes.

Instrument support requested for on-disk target:
1. SOT/SP: normal or deep mode scan of the AR.
2. SOT/FG: G-band and Ca II H at moderate cadence (~30-60s), NFI LOS magnetogram at low cadence (~3-5 min). 2x2 summing on all. FOV to include as much of the AR as possible. Focus set for compromise between SP and FG.
3. EIS: RBE program TBD.
Rough estimate of data usage for 2 hours: 800 Mbits SOT/FG, 800 Mbits SOT/SP, EIS TBD.

Instrument support requested for limb target:
1. SOT/FG: Ca II H at high cadence (~10s), deep exposures, 2x2 summing, small FOV is ok.
2. EIS: RBE program TBD.
Rough estimate of data usage for 2 hours: 800 Mbits SOT/FG, EIS TBD.

Notes: IRIS support has been requested and granted. The HOP calendar is empty in this time period, a HOP130 is schedule just prior. Marc DeRosa and Ichimoto-san will be SOT COs during this period.

Thanks,
Alfred
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